Floodwater Forum

Floodwater Forum Proceedings

National Capital Planning Commission ★ General Services Administration ★ U.S. Department of Homeland Security ★ Government of the District of Columbia

June 2007 Flood Forum

On June 12 and 13, 2007, the National Capital Planning Commission (NCPC), the General Services Administration (GSA), the Department of Homeland Security (DHS), and the District of Columbia government sponsored a flood forum for federal and local officials. More than 100 participants attended.

The partner agencies convened the forum to explore the causes of severe flooding in the Federal Triangle Area in June 2006. The severe flooding, which was unforeseen by those affected, exposed the untenable risks of excess stormwater given the dual concentration of priceless cultural and historic resources and federal government operations in a small geographic area. The forum sought to reduce the risk of future flooding, and better plan for emergency response when unavoidable flooding occurs. .

The forum had five goals:

1. To better understand the flood risks in the District's monumental core,
2. To explore options to minimize flooding risks through strategies aimed at planning and coordination, prevention, and infrastructure measures,
3. To obtain local and federal consensus on strategic actions that will result in measurable risk reduction,
4. To improve coordination and cooperation between the relevant government agencies, and
5. To serve as a model for other cities for emergency preparedness and stormwater management.

The forum brought together more than 100 local and federal officials, many of whom had not previously worked together on emergency response or stormwater management in the District. NCPC staff is extremely appreciative of the commitment demonstrated by the forum cosponsors and all of the attendees. The forum was not a passive conference of speaker presentations, but an active two-day working session. A number of participants made presentations that were instrumental to the forum's success, and throughout the two days the attendees worked in an exemplary manner to develop a full range of strategies and action items. By the end of the forum, the attendees had developed a robust set of interagency recommendations to address all of the identified issues.

Forum Proceedings

This report serves as the proceedings of the Flood Forum. NCPC's goal was to record as accurately and succinctly as possible the discussion among forum participants, the flooding issues identified, and the potential solutions devised.

Background

On June 25, 2006, rain fell steadily in the Washington, DC, metropolitan area. Within a 24-hour period, enough rain fell to break previous rainfall records around the metropolitan area, to inundate a number of prominent federal buildings, to flood two metro stations, and to make the 9th and 12th Street tunnels under the National Mall impassable. Fortunately, the period of greatest rain fell on a Sunday evening, when the numerous office buildings, museums, and Metro stations were empty. Although the flooding ultimately caused federal property damage in excess of $32 million, not a single person was harmed, and irreplaceable treasures in the National Archives and National Gallery of Art remained safe.

Because the flooding resulted from heavy rainfall not overbank river flooding, the National Mall levee was not involved. In fact, the Potomac River remained below flood stage through the entire event.

Flooding in the monumental core flooding occurred because the sewer system could not handle the stormwater. DC WASA maintains that the rainfall, which set a number of new rainfall records, simply exceeded the capacity of the sewer system. A consultant retained by the General Services Administration (GSA) suggested that the flooding's cause may be more complicated because their research found that past storms of similar magnitude did not produce the same flooding impacts. However, the purpose of the forum was not to determine the cause of the June 2006 flooding but instead to recognize that flooding is a significant risk for federal operations, and the priceless art, historic buildings, and cultural treasures located in the monumental core. The forum was the first step toward addressing how federal and local officials can work together to develop an effective, coordinated response to this risk.

Research by NCPC, undertaken after the June 2006 event, found that the hydrology, topography, and geography of the monumental core makes interior street flooding a separate, persistent issue from river flooding; one that needs an independent solution. Topographically, the monumental core is the low point for the surrounding area, where groundwater and stormwater runoff naturally collect. Areas that once were part of the Tiber Creek riverbed and the Potomac and Anacostia shorelines were "reclaimed" to accommodate the rapid expansion of the federal city. A century of urban development has not altered the area's natural hydrology, and water above and below ground still flows toward the geographical low-points.

The sewer system in the monumental core is old, and according to the DC WASA website, much of the original construction was poorly planned, structurally unsound, and hydraulically inadequate. Sewer upgrades have occurred in the

area over many years and in piecemeal fashion. The capacity of any particular sewer section varies and depends on the design standard used at the time of construction or renovation. DC WASA reports that, the system's capacity varies between a 2-year storm event and a 15-year storm event.

Sewer system construction in the monumental core typifies the blend of local and federal participation, funding, and interests that characterized the development of the nation's capital and continues to this day. Federal officials oversaw the construction of the combined sewer system, which was funded with Congressional appropriations and still serves the monumental core. In the 1890s, a presidentially appointed Board of Engineers recommended that the original combined system be retained. This decision greatly influenced the major portion of the current sewage system that is in use today. In 1938, the District of Columbia Water and Sewer Utility Administration was created and had management authority over the water and sewer system. Subsequently, the District government created the DC Water and Sewer Authority (DC WASA) in 1996 to function as a semi-autonomous regional entity. As such, funding for operations, improvements, and debt financing is now raised through user fees, grants, and the sale of revenue bonds.

Like many older cities, Washington, DC's aging water and sewer infrastructure needs major renovations. Combined sewer overflows (CSOs) occur regularly in violation of the Clean Water Act (CWA) and DC WASA has agreed, as part of a consent decree, to construct large storage tunnels over the next 20 years to retain excess wastewater until the sewage can be treated properly prior to its release. However, the tunnels will not prevent street flooding due to excess rainfall.

The $2 billion cost to construct the tunnels is just a portion of the overall DC WASA budget. DC WASA's $5 billion capital program includes projects in the water system, wastewater system, treatment plant and other areas. Regulatory mandates (such as nitrogen removal at the Blue Plains Treatment Plant) take first priority for capital expenditures. Second in importance are any projects essential to health and safety. Projects needed for good engineering practice, such as those to address the issues in the monumental core, although important, rank lower in DC WASA's priority ranking system.

Flooding in the monumental core poses an unacceptable risk. Flooding poses risks to the numerous cultural and historic resources in the area, federal buildings and property, federal agency operations, the transit system, and national security, given the concentration of key federal functions. Any one of these reasons is enough to justify a continuing investigation of ways to reduce the frequency and severity of flooding. While the design of any engineered solution will have a maximum limit, it is incumbent upon federal and local stakeholders

to proactively determine an acceptable level of flooding risk. Furthermore, an in-depth review of recent flooding provides a unique opportunity to determine how federal and local officials can be better prepared to respond before, during, and after a flood event.

Improvements to emergency preparedness are especially important because another monumental core flood is unlikely to occur on a deserted Sunday evening. Response and recovery efforts would be far more complicated if emergency personnel had to evacuate the sizeable federal and private workforce when all Metrorail stations in the vicinity are inoperable.

Flood Forum Attendees

NAME	ORGANIZATION
Donald J. Rissmeyer	A. Morton Thomas/GSA Consultant
Beverly Wood	Architect of the Capitol
Jodi Beauchamp	Army Corps of Engineers
Hiram K. Brewton	DC BID
Lito Tougson	DC BID
Damian Wilk	DC Fire/EMS
Mark Brown	DC HSEMA
Patrice White	DC HSEMA
Chris Shaheen	DC Office of Planning
John Dunn	DC WASA
Katherine Cahill	DC WASA
Roger Gans	DC WASA
Tim Karikari	DDOE/WPD
Emeka Moneme	DDOT
Natalie Jones Best	DDOT
Mario Aquiro	Department of Commerce
Cathy McIntyre	Department of Justice
Chau Tran	Department of Justice
Louis Naber	Department of Justice
Mike Ragan	Department of Justice
Ken Wall	DHS/FEMA NCRC
Robert Goo	Environental Protection Agency
Tom German	FBI
Chris Geldart	FEMA ONCRC
Nancy Carpenter	FEMA R3
Michael Hicks	FHWA
Anthony Mondy	General Services Administration
Bob Roop	General Services Administration
Carlyle Turner	General Services Administration
Dean Smith	General Services Administration
Dennis Drake	General Services Administration
Diane Stolz	General Services Administration
Greg Westphal	General Services Administration
Guy Miconi	General Services Administration
Guy N. Miconi	General Services Administration
Jack Gott	General Services Administration
Joe Lawler	General Services Administration
Jonathan McIntyre	General Services Administration
Joseph Lawler	General Services Administration
Kathleen Myer	General Services Administration
Margaret Gates	General Services Administration
Mark Vesley	General Services Administration
Mike McGill	General Services Administration
Rodney Moulden	General Services Administration

Susan Sylvester	General Services Administration
Terry Forline	General Services Administration
Thomas Otto	General Services Administration
Vicki Willmann	General Services Administration
Vicki Willmann	General Services Administration
John Cassidy	Greely & Hunter
Elliott Doomes	House Transportation
Adela J. Gresham	Internal Revenue Service
Andrew Groom	Internal Revenue Service
David Gowin	Internal Revenue Service
Dennis Jenkins	Internal Revenue Service
Kevin McIver	Internal Revenue Service
Kevin Q. McIver	Internal Revenue Service
Pablo alvarez	Internal Revenue Service
Pablo R. Alvarez	Internal Revenue Service
Richard Moore	Internal Revenue Service
Matt Larsen	JSA
Bryan Christian	MPD
Jeff Brown	MPD
Steven Sund	MPDC
John Bartell	National Archives and Records Administration
Mark Sprouse	National Archives and Records Administration
Rick Judson	National Archives and Records Administration
Darnell Willson	National Gallery of Art
John Robbins	National Gallery of Art
Kurt Sisson	National Gallery of Art
Philip Goldsmith	National Gallery of Art
Susan Wertheim	National Gallery of Art
Doug Curtis	National Park Service
Mary Willeford Bair	National Park Service
Stan Tolman	National Park Service
Chris Strong	National Weather Service
John Imparato	Navy
Tom Lewis	Navy
Lisa MacSpadden	NCPC
Lucy Sherman	NCPC
Stefanie Brown	NCPC
Tony Champ	NCPC
John Robbins	National Gallery of Art
Geoff Bonnin	NOAA/NWS
Sanja Perica	NOAA/NWS
Stan Tolman	NPS
Richard Hitchens	NWS
Spencer Davis	OPM/FMD
Pete Pedersen	PEPCO
Raj Setty	Setty & Assoc
Jay Durst	SI/OFEO

John Lagundo	SI/OFEO
Bayne Rector	Smithsonian Institution
Jane Passman	Smithsonian Institution
Jay Durst	Smithsonian Institution
Nancy Bechtol	Smithsonian Institution
Ed Doheny	US Geological Survey
Joan Hairston	Washington Gas
Mike Hodge	Washington Gas
Charles Karpowicz	Water Resources
Colin A. Myers	WMATA
Leroy Padgett	WMATA
Paul Petersen	WMATA
Ronald Williams	WMATA

FLOOD FORUM AGENDA

Jointly chaired by National Capital Planning Commission (NCPC), General Services Administration (GSA), U.S. Department of Homeland Security and the Government of the District of Columbia

DAY ONE -- TUESDAY, JUNE 12, 2007

1 - 1:30 pm – **Opening Session -- Welcome & Introduction by Co-Chairs**
John Cogbill, National Capital Planning Commission Chairman
David Winstead, GSA PBS Commissioner
Chris Geldart, DHS Director of the Office of National Capitol Region Coordination (ONCRC)
Dan Tangherlini, City Administrator, Government of the District of Columbia

1:30 - 2:30 pm –**Discussion of the Flooding & Stormwater Risks in the Monumental Core**

2:30 – 2:45 pm – BREAK and MOVE to Sessions

2:45 – 5:00 pm – **Concurrent Sessions**
The goal of these sessions is to briefly review the topic and identify the key issues to be resolved in the workshop process scheduled for the following day.

Session 1–Emergency Management Planning and Coordination
SPEAKERS:
Don Keldsen, U.S. Department of Homeland Security (DHS), Federal Coordinating Officer (FCO) for the District of Columbia
Mark Brown, Deputy Director, District of Columbia Homeland Security and Emergency Management Agency (HSEMA)

In the event of flooding, is there a comprehensive plan in place for during and after the disaster? Are there sufficient plans for each potentially affected location? Is there a plan for coordination between sites?

Session 2 –Stormwater Management Panel
Discussion of potential stormwater management controls
SPEAKERS:
Robert Goo, U.S. Environmental Protection Agency (EPA)
Tim Karikari, P.E., Chief, Technical Services Branch, District Department of the Environment (DDOE)
John Imparato, Corporate Information Management HQ, Naval District Washington

Can the stormwater in the monumental core be more effectively managed and controlled, either on-site or off-site, by the relevant stakeholders?

Session 3 -- Infrastructure Challenges & Opportunities
Discussion of the sewer system, dewatering, interagency roles in operation, and management of the system, and opportunities to mitigate potential risk
SPEAKERS:
Roger Gans, District of Columbia Water and Sewer Authority
Jodi Beauchamp, Acting Government Affairs Officer, U.S. Army Corps of Engineers
Emeka C. Moneme, Director, District Department of Transportation

Are there any feasible, cost-effective improvements to the existing infrastructure or management and operation of the sewer system that will mitigate the risk of flooding?

DAY TWO -- WEDNESDAY, JUNE 13, 2007

7:30 am -- **Continental Breakfast and Informal Networking**

8:00 – 10:30 am -- **Concurrent Work Sessions Continue**
The goal is to review the issues identified the previous day and develop a work plan with tasks and task masters for the next 6 months. At the conclusion of the session, each group is to have obtained consensus on a number of strategic actions that will result in measurable risk reduction and improve coordination and cooperation among the relevant agencies.

10:45 – 12:00 – **Report Back and Wrap Up – Session Open to Public and Media**
John Cogbill, NCPC Chairman
Reports led by Facilitators of each break-out session
Dan Tangherlini, DC City Administrator

12:00 – 12:30 – **Closing Session**
John Cogbill, NCPC Chairman

Opening Session

The forum started with a brief general session designed to provide an overview to the flooding and stormwater risks in the monumental core. Three of the four cosponsors spoke at the opening session and noted the forum's importance.

NCPC Chairman John Cogbill welcomed the forum's participants, noting that he was ready to "roll up his sleeves" and work with all of the relevant federal and local partners in search of comprehensive solutions to the serious periodic flooding in the District that threatens key federal buildings. Mr. Cogbill was hopeful that the partners could collaborate to find an imaginative solution to managing stormwater more effectively, a solution more befitting the nation's capital, one that can be a model for other cities in America.

GSA Commissioner of Public Buildings Service, David Winstead, conveyed his agency's deep and abiding interest in the forum's workplan because GSA has the job of operating and maintaining the federal buildings that are at risk. Mr. Winstead described the extent of the damage federal buildings sustained from the June 2006 flooding and outlined two potential courses of action: (1) for vulnerable federal buildings to be surrounded by newly constructed levees and reconfigured to install critical systems above potential floodwaters, or (2) for the federal government to join forces with the District of Columbia, the National Archives, the Smithsonian, and the National Gallery of Art to achieve a system-wide solution that reduces the threat of flooding.

Chris Geldhart, Director, the Office of the National Capital Region Coordination for DHS, told participants that he was committed to helping ensure all federal agencies are able to function, uninterrupted by natural or manmade events, in times of national emergency. Flooding of the June 2006 magnitude is costly to national historic and cultural resources, but it becomes a security threat when the infrastructure of certain federal buildings is put at risk. Mr. Geldhart implored participants to use the forum to devise recommendations not only for flood events, but for the full range of potential disaster events that could befall the capital.

While District of Columbia Administrator Dan Tangherlini was scheduled to speak at the opening session, Mr. Tangherlini had scheduling conflicts that prevented his participation in the session.

Following the presentations by the cosponsoring chairs, NCPC staff member Michelle Desiderio and GSA staff member Mike McGill made brief presentations on flooding risks. DC WASA Deputy General Manager John Dunn also spoke about flooding risk and sewer system operations in the monumental core.

Forum Work Sessions

The forum participants were divided into groups to address three main issue areas: emergency planning and coordination; stormwater management; and infrastructure challenges. Each of the three sessions opened with a short presentation that provided brief overviews of the topics.

The participants then discussed the outstanding issues related to their topic; how the response could have been improved before, during, and after the flooding; and ways to minimize the flooding risks. Once the participants gained consensus on the outstanding issues for their group, they devise strategies to reduce the chance of flooding. They also worked on flood response strategies that would ensure an earlier, quicker, more coordinated, and more effective response. These strategies were then discussed in more detail and each work session worked quickly to cull the strategies that had the most support from the group. These were strategies that each session presented to the larger forum during the public session.

Closing Session

The forum concluded with a general public session in which each work group reported on the potential solutions developed to address the specific flooding and stormwater risks that had been identified. While there was no opportunity for the public to comment at the forum, the public could submit written comments on sheets that were provided. .

Chairman Cogbill concluded the forum with the four key themes he observed from the proceedings: communication, cooperation, creativity, and cost. Mr. Cogbill noted that while the federal and local partners have a fairly good system for communication, we have to communicate even better during emergencies, and between emergencies, so that the problems that occurred in June 2006 do not happen again. He acknowledged the many different entities that must cooperate to create a better plan and response for the monumental core. Mr. Cogbill praised the participants for their creativity but cautioned the audience that the group would need to figure out how to pay for implementing these recommendations and sharing the costs among the various stakeholder entities. Last, Mr. Cogbill noted that the forum was merely the beginning of a longer planning and policy discussion and that all the participants must stay engaged to see their solutions realized.

Below is a summary of the work completed by each of the three sessions:

- Emergency Planning and Coordination,
- Stormwater Management
- Infrastructure Challenges and Opportunities.

Emergency Planning and Coordination

EMERGENCY RESPONSE PRESENTATIONS

Mark Brown, District of Columbia Homeland Security and Emergency Management Agency
Mr. Brown reviewed the District's emergency response structure; the communication capabilities in the District; the existing partnerships among federal, local, and private entities; and the emergency preparedness actions DC HSEMA has undertaken.

Don Keldsen, U.S. Department of Homeland Security
Mr. Keldsen discussed the Department of Homeland Security and its role and responsibilities in emergencies and for disaster planning.

Chris Strong, National Weather Service
Mr. Strong reviewed the June 2006 storm statistics, the most common weather-related flood threats for the District, and the weather information provided by the National Weather Service.

Since September 11, 2001, emergency planning and collaboration have increased significantly nationwide, albeit focused on major natural disasters and terrorist-sponsored incidents. The issues that arose from the June 2006 flooding occurred despite recent federal and local emergency response planning and procedures. During the forum federal and local participants assessed the response to the June flood, proposed recommendations to reduce or eliminate future flooding risks, and determined if any lessons learned could be applied in future emergency responses.

The unexpected flooding on June 25, 2006, affected a small geographic area. Federal buildings sustained the majority of property damage, and some federal agencies' operations were disrupted. A few federal functions were relocated for a period of up to six months while the damage was repaired. Unlike other domestic natural disasters, in this instance the need was not for federal emergency relief to local governments and the private sector but rather for federal-to-federal aid. As a result, the national exposure that usually attends natural disasters did not occur.

Events leading up to the June 2006 flooding and the subsequent emergency response during and after the flooding exposed some successes, some failures, and some areas for improved federal and local incident-related prevention, preparedness, response, and recovery activities. Forum participants identified several emergency planning and coordination issues from their individual and collective experiences during the June 2006 flooding.

Effective and efficient coordination is critical in the monumental core because it is home to scores of executive agency headquarters and serves as the federal

operations hub. In short, federal agencies must improve interagency coordination and communication, and improvement is needed between the federal government and the District of Columbia government before, during, and after an emergency.

First and foremost, while many federal agencies have developed their own internal emergency plans, commonly referred to as COOPs (Continuity of Operations Programs), none seems to have coordinated emergency planning efforts with other agencies. The need for federal emergency planning coordination is acute in the nation's capital, and is vital within the monumental core given the concentration of key executive branch functions. Federal personnel reported that they were inadequately prepared to respond appropriately or efficiently to the flooding, either before, during, or after it occurred. The existing emergency communication network was incapable of dispensing critical information among federal agencies, and there is no systematic way for agencies to share information securely in non-emergency situations.

Second, despite the operation of a number of alert and emergency notification systems, federal personnel are not adequately plugged into the existing communication systems. The National Weather Service (NWS) began predicting the possibility of flooding as early as June 21, four days before it occurred. The NWS watch increased to a flood warning through Sunday, June 25 at 8:51 pm. Their flood warnings specifically called out the potential for flooding in the District of Columbia especially in "urban areas, streets, underpasses, and *low-lying areas*" – all accurate adjectives for the monumental core. While no one could have predicted the severity and intensity of the flooding that occurred, it appears that no federal authority with facilities in the low-lying areas of the city heeded the NWS warning and prepared for the possibility of a flood. This failure could be explained in part by the fact that storms of similar magnitude in the past two decades have not caused the degree or severity of flooding that occurred on June 25.

In the future, federal government facilities managers will need to monitor the NWS warnings more closely given that flooding is a serious possibility in heavy, prolonged rain. The District of Columbia Homeland Security and Emergency Management Agency (DC HSEMA) has implemented DC Alert, a text notification system that allows citizens to receive emergency text messages on cell phones, computers, pagers, and fax machines. Many of the federal agency participants had not heard of, nor signed-up to get, DC emergency text messages. There appeared to be no previous federal discussion about how "deep" organizationally to network specific agency emergency responders. Even if the DC Alert System had more subscribers, one continuing problem is the timeliness of text alerts.

Even when the District sends out an alert quickly and effectively, the system relies on private wireless communication providers to deliver the messages, and some users report significant delays in receiving messages. In addition, once the flooding had started, there was no communication system for federal building managers to coordinate and be in contact with each other.

Third, effective emergency response is determined by well-thought-out procedures and established, trusted relationships, both personal and organizational. Coordination and communication improvements should result in improved policies and procedures. However, equally important is building the relationships among emergency responders before a disaster or emergency strikes. Key emergency responders from the various organizations should get to know each other before an emergency happens and rehearse their roles and responsibilities in emergency drills and simulations. Familiarity can ease the anxiety and stress of an actual emergency.

Fourth, the participants recommended establishing a stronger, more transparent, evident "Command-and-Control" structure in the monumental core because of its national importance and prominence. Participants used "command-and-control" generally to mean authority and direction of a designated leader over staff and resources to accomplish a specific task (as in responding to an emergency). Command-and-control authority typically extends over personnel, equipment, communications, facilities, and procedures and is used to plan, direct, coordinate, and control all of the operations to accomplish a single mission.

In the event of an emergency, federal and local personnel need a single point of contact. To date, federal policy requires that to the extent possible, emergency events should be handled at the lowest jurisdictional level possible. Events with greater complexity, magnitude, or severity are considered "Incidents of National Significance" and come with detailed, specific protocols for response. The June 2006 flooding was somewhat of a paradox. Overall, its geographic impact was relatively small and localized; the necessary response (flood clean-up) was rather routine. However, the concentration of federal operations in the monumental core automatically elevates any incident within this area and requires a unique set of standards.

The lack of existing protocol for the restoration of utilities such as electricity after an emergency, and the lack of an interagency plan for back-up power generation were among the troubling issues that the forum participants documented. Pepco shut down the entire Federal Triangle area power grid once the flooding started, however, after the floodwater dissipated there was no plan for prioritizing which agency should have power restored first. Power restoration is critical to both the

continuity of federal government operations as well as for the priceless art and historical collections in the area's museums and archives.

Despite existing federal and/or local emergency and disaster plans, the perception of session participants is that coordination, planning, and communication are deficient. At a minimum, they agreed that both federal and local agencies should address any deficiencies, improve incident management communications, and increase situational awareness across jurisdictions at all levels. In particular, the collective experience of forum participants is that the District government scored relatively high on its emergency response to the flooding; the federal-to-District communication was passable, but could be improved; but the federal-to-federal communication was unacceptable. The poor communication and emergency response among federal agencies is particularly troubling given the relatively uncomplicated nature of the emergency that occurred.

Forum participants identified the following recommendations for improving emergency response and coordination. The recommendations roughly match the issues identified above.

1. Create an integrated information-sharing infrastructure between local and federal agencies. Due to national security concerns, critical federal agency information is not being shared among agencies. For example, many federal agencies have building construction and system plans, maintenance records for key building systems, back-up generator locations, and "live" contractor contacts that would be extremely useful if shared with other federal agencies in an emergency. A secure interagency information architecture designed to facilitate the sharing of information among agencies can address this issue.

   There are several working examples of such technologies in use today. One example of integrated information sharing is the National Information Exchange Model (NIEM), a joint effort between the Department of Justice and DHS. NIEM establishes a single standard XML foundation for interoperable information sharing and data exchange at a national level. Through the use of information exchange standards and processes, NIEM enables federal, local and state agencies to share critical information in emergency situations.

   Although the NIEM example is grander in scale than what is envisioned here, it offers a proven model for information sharing to support the federal response to emergency events in the monumental core.

2. Federal Clearinghouse. Federal stakeholders noted that in an emergency they need a single contact point for resources, additional staff support, and equipment, such as additional pumps or back-up generators.
3. Beyond "Paper" Compliance with NIMS: DHS established the National Incident Management System (NIMS) to provide a consistent nationwide template so that federal and local governments can prepare for, prevent, and respond to "domestic incidents." Unfortunately, while many of the federal participants noted that they are officially "NIMS-compliant," they were no better prepared to deal with a crisis when it occurred. The working group members specifically noted the importance of not just having emergency manuals, but actually practicing for an event together.
4. COOP Coordination. Every federal agency has a COOP plan but they are not coordinated with one another. DHS and the relevant federal COOP officers must coordinate individual agency plans to ensure satisfactory, synchronized emergency response.
5. Emergency Response Redundancies: Each agency needs to designate a chain of command for responding to an emergency because situations will occur in which a designated person is not available. Emergency contact lists must be updated and maintained 24/7 so that they are available and accurate whenever an emergency strikes.
6. Methodology to Improve Response Time and Effectiveness: All of the participants stated that the June 2006 flooding taught them important lessons on what they did right and what they might have done differently. Unfortunately, there has not been any opportunity or means for them to share what they learned so that a future emergency response can be more effective. Federal and local officials need to devise a process for public agencies and organizations to discuss, identify, and record best management practices after an emergency response. In the future it will be important for federal and local officials to have a secure interagency technology solution to access and share best management practices. Officials from organizations such as WMATA and the Smithsonian must be included in the user groups.
7. Office of Personnel Management (OPM) Participation. OPM did not participate in the forum because the agency was not directly affected by the June 2006 flooding. However, OPM's participation in the event of a disaster or emergency in the monumental core is critical because of the concentration of federal employees in the area. During the forum, participants noted that their agencies had varying levels of success in notifying employees about the flooding and the impact on different workplace locations. In the future, OPM should be actively engaged to ensure the safety of the federal workforce.

8. Better Utilize the Existing Emergency Notification Systems. Forum participants emphasized the importance of an early warning system for emergencies. They recommended that all key federal response staff be connected to the existing emergency alert system. They also recommended that all federal buildings in the monumental core be equipped with floodwater alarms as an additional early warning system. Other than "flood alarms" in buildings they did not have specific suggestions as to how to improve the existing notification systems. Participants did agree that more federal personnel need to "plug into" the existing emergency notification systems.
9. Developing Relationships among Key Personnel: Session participants emphasized the importance of relationships among emergency responders. Before a disaster strikes it is important to know the other emergency responders because familiarity can help ensure that the response is effective and efficient. Participants suggested that key emergency responders get together periodically to meet one another. Specifically, some participants suggested the formation of a coalition of Federal Triangle building managers.
10. Designate a Single Point of Command: For the federal participants, it was unclear who was responsible for overall coordination of the emergency response to the flooding. Federal participants suggested that it would be best if a single point of command was established for the monumental core to make the response more effective and coordinated. While The National Response Plan designates DHS as lead for "Incidents of National Significance," it may be useful to designate DHS or another federal entity for all incidents within the monumental core.
11. Consistent Government Policies for Emergency Events. Too often an emergency event such as flooding suspends normal operations. In June 2006 vehicles needed for response and cleanup needed to be located near the affected federal buildings, in violation of normal parking regulations. A number of these vehicles received tickets from DC DOT. Because of the pending Fourth of July Parade, the police almost towed the emergency trailers parked adjacent to the IRS Headquarters on Constitution Avenue that were being used to dry out, clean, and repair the building. Towing was avoided only after the Federal Protective Service intervened. While seemingly small in impact, it would be helpful if a process was devised to avoid similar incidents during emergencies.

Stormwater Management

Stormwater Presentations

Robert Goo, U.S. Environmental Protection gency
Mr. Goo presented an overview of the different low impact development measures that can be employed to control stormwater runoff, the role these measures could play in the Federal Triangle area, and highlighted the recently constructed rain garden at the EPA Headquarters building.

Tim KariKari, District of Columbia Department of the Environment
Mr. KariKari documented the District's stormwater regulations, emphasized the importance of low impact development (LID) measures, but noted that there are currently no regulatory or financial incentives for LID, and pointed out there needs to be better coordination between the local and federal government with regard to stormwater measures.

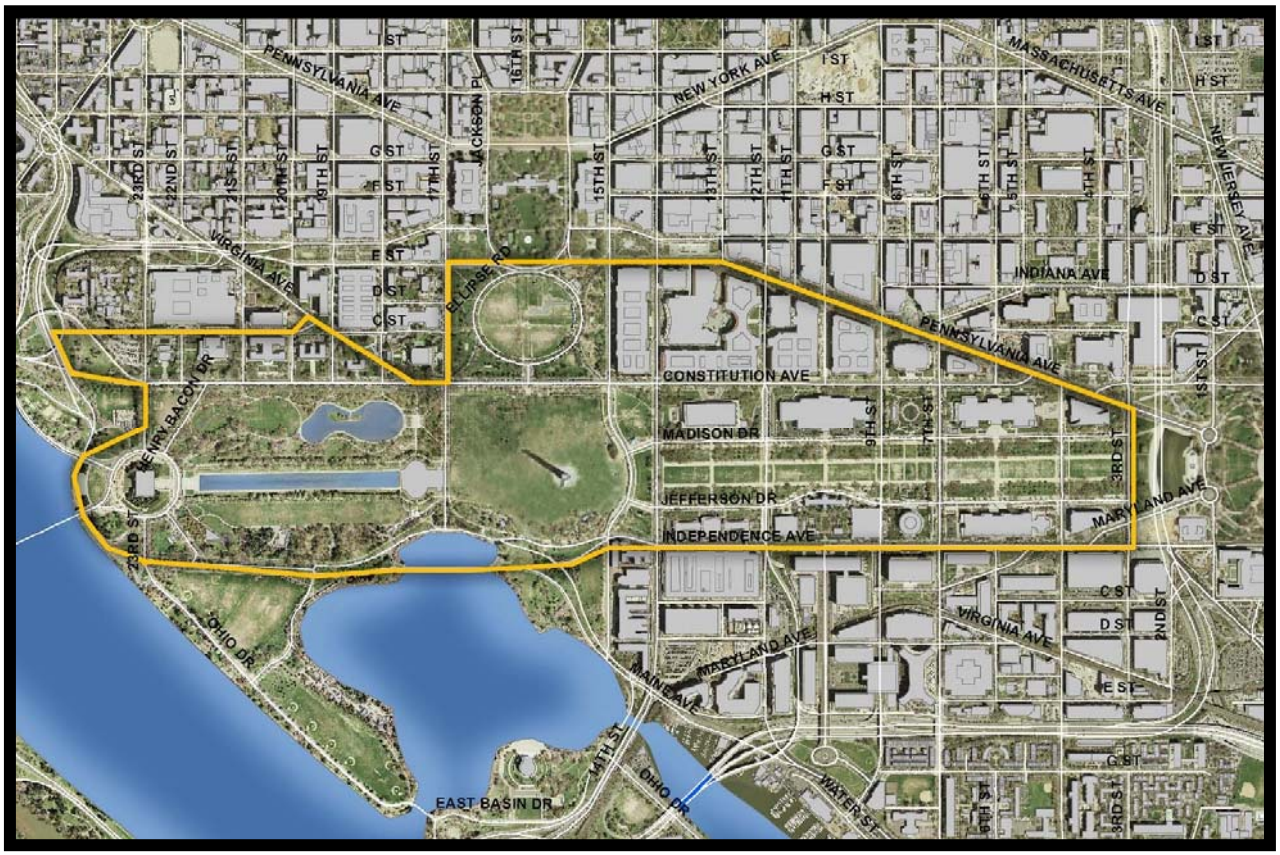
John Imparato, Navy Department
Mr. Imparato asserted that for existing buildings, federal building managers should consider LID retrofitting as a stormwater management technique and he invited any interested parties to tour the Navy Yard to see the LID measures they have successfully employed.

Geoff Bonin, National Oceanic and Atmospheric Administration
Mr. Bonin discussed NOAA's precipitation frequency estimates which are an excellent resource for modeling system capacity and calculating the risk of flooding in a particular given year.

In planning for the forum, NCPC staff envisioned the Stormwater Management session as a discussion of how innovative stormwater management might reduce the peak flow of runoff into the sewer system in the monumental core. Although an unusually large amount of rain fell in a short period in June 2006, the underlying problem of rain exceeding the sewer capacity could occur with far smaller amounts due to the varying capacities of the sewer pipes in the area. Consequently, NCPC staff believed it would be useful to discuss methods that would delay or reduce the peak flow of stormwater into the sewer system. From the beginning of the session, however, session participants had basic questions about the flooding that occurred, the area's hydrology, the existing sewer system capacity, and the appropriate governance structure for stormwater management. Participants expressed frustration that more complete and accurate information about flooding risks is not readily available. In general, this session's deliberations did not progress as quickly as the Emergency Management Session because the participants struggled with cause and effect and found difficulty in identifying issues and recommending solutions when their basic flooding questions could not be answered. Consequently, the need for additional research and better information was cited as a top priority for this session. A primary recommendation from this session, and from the Infrastructure Challenges Session, was to fund an in-depth study of the area's hydrology and sewer system to assess the likelihood of future flooding and devise a comprehensive strategy for

reducing future flood risks. . If we can obtain better information about the stormwater management system and its limitations, along with a deeper understanding of surface and groundwater issues, the ensuing discussion about potential solutions can be better informed and nuanced. The recommendation for an in-depth study is discussed in greater detail in the Infrastructure Challenges Section below.

Another major discussion at this session was the appropriate size of the study area. NCPC initially proposed that the study area for the forum be limited to the monumental core as illustrated by the map below.



FLOOD FORUM STUDY BOUNDARY AS PROPOSED BY NCPC.

ACOE previously identified this general area as at-risk for street flooding due to its relative low elevation compared to the surrounding area. However, many participants noted that runoff drains into the entire downtown area because it lies below the higher elevations of the Florida Avenue escarpment. As a result, participants suggested that the area of study be larger than originally proposed. The participants did not recommend a specific study area because they needed more information about the hydrology of the area to make such a decision.

During the session, some participants discussed the importance of determining an appropriate flooding baseline for the monumental core. For example, if we agree that the systems in place should be capable of handling a 20-year storm event, and we know the sewer capacity is less than that, should we fund increased sewer capacity? If so, to what standard? Another potential option is to determine whether it is acceptable for the streets to be the holding area for excess stormwater. However, participants did not reach consensus on whether setting a flooding baseline was desirable. One participant suggested that this method was flawed because any baselines by definition can be exceeded by a more severe storm event. Instead, federal and local officials should take a risk- based approach that would characterize existing and future flood potential, assess the vulnerability of floodplain occupants to flood damage, and formulate and evaluate the costs and benefits of a range of potential solutions. For example, there may be zero tolerance for any flooding risk that would endanger the priceless artifacts, historic documents, and art collections in the National Archives or the Smithsonian. A "zero tolerance" policy would yield very different decisions and recommendations than setting the standard at the 20-year storm, which has a 2 percent chance of occurring each year.

Forum participants discussed the need for increased sewer maintenance and inspections, in addition to needing information about the area's hydrology, the structural integrity of the sewer system, and any systematic limitations. DC WASA stated that they will repair damage to the sewer system but not build new sewers. In addition, while DC WASA inspects the sewer system, there is no dedicated capital improvement program for the maintenance or repair of the system within the Federal Triangle Area. Last, it is unclear whether construction of the $2 billion underground storage tunnels will be such a great capital expense that routine inspection and maintenance will be deferred as a result.

Underlying the discussion regarding the information that needs to be collected and where the study boundaries should be drawn was the issue responsibility for the problem at hand. Some of the sewer problems are historical and arise from the unique mix of federal and local responsibility throughout the District's development. While the federal Corps of Engineers originally built the sewer system in the monumental core, presently DC WASA, a semi-autonomous agency of the District government, operates and maintains it. The system operates under federal permits issued by the Environmental Protection Agency (EPA), which establishes important requirements for how it functions. DC DOE enforces local stormwater regulations; however, most federal buildings in the monumental core predate the District's stormwater regulations and therefore do not meet current requirements. DC DOE also notes that because the District does not have regulatory authority over federal construction, city officials often have been unable to inspect federal buildings and are unfamiliar with the internal building

systems affecting wastewater or stormwater. Keeping the streets and catch basins clean and free of debris so that stormwater flows into the system freely and does not back-up on the streets, and the sewer pipes remain unobstructed, is another important flood prevention strategy. These tasks are the responsibility of two additional agencies: DDOT and DC DPW. Moreover, DDOT is responsible for new sewer construction or replacement, which they incorporate into their street repair and maintenance program. In the end, it was clear that a number of government agencies and quasi-governmental entities have some responsibility over stormwater in the District, but no one entity has absolute control. As a result of the complex governance structure involving numerous agencies and levels of government, there appear to be gaps in operation and maintenance and an overall lack of coordinated planning for the system as a whole.

Site-specific stormwater management practices can't eliminate flooding risk in the monumental core, but they can help reduce the peak flow of stormwater into the sewer system within the core and can also help reduce excess stormwater in the entire watershed if applied more broadly. Participants in the Stormwater Management session did spend part of their deliberations on innovative stormwater measures. Both local and federal speakers described how stormwater runoff could be managed on-site through low impact development (LID) and other innovative measures such as green roofs. To date, these techniques have not been promoted or implemented in any meaningful or comprehensive way within the monumental core; as a result their effectiveness has not been tested.

Some attendees suggested that low impact development (LID) measures had not been implemented due to design requirements imposed by NCPC and the Commission of Fine Arts. Other attendees suggested that the main barrier to LID was the lack of financial or regulatory incentives. At present, there are no financial or regulatory incentives for federal, local, or private property owners to utilize LID for stormwater management. As a result, development in the District typically funnels stormwater directly and immediately into the sewer system through pipes, drains, and other engineering measures. Even average storms can overwhelm the system with excess rainwater and cause operational and environmental issues because the runoff from the city's impervious surfaces surges quickly into the pipes, accumulating rapidly as it moves "downstream" in the system. An alternative to low-impact development incentives (the carrot approach) are regulatory requirements (the stick approach).

Last, participants noted that a best management practices handbook on low impact development would be useful to encourage federal building managers to incorporate low impact measures during building renovations or modernizations. Consequently, there was widespread support for NCPC to develop and promote best management practices (BMPs) for stormwater. GSA

currently promotes green building measures and conformance with the U.S. Green Building Council's LEED (Leadership in Energy and Design) standards, but they have not mandated any specific stormwater management measures, and the LEED guidelines are not particularly stringent regarding stormwater. Participants believed that a separate set of stormwater standards or guidelines for federal buildings would be a worthy recommendation.

Three key flooding risks emerged from this session.

First, excess stormwater is a problem for the monumental core because it is the topographic low-point and gravity ensures that water will collect there. Thus, any long-term, comprehensive stormwater management plan must include areas beyond the monumental core. Failure to do so will result in persistent flooding problems that threaten the continuity of governmental operations and endanger priceless historic and cultural resources.

Second, neither federal nor local officials currently have an in-depth understanding of the monumental core's hydrology, its physical systems, or the regulatory authorities in place to manage it. Without better information and a more transparent governance structure, federal and local stakeholders are unable to develop cost-effective and risk-balanced solutions for the short- or long-term.

Third, catastrophic flooding, although infrequent, is a distinct possibility. Given the resources at risk in the monumental core, plans are necessary to be fully prepared for that inevitability. Whether waterways run over their banks or rainfall exceeds the capacity of the sewer system, the damage sustained will be determined by the risk level we accept or from a failure to prepare at all.

This session also struggled with identifying an appropriate timeframe for recommended solutions. On one hand, the participants had a sense of urgency for flood prevention solutions given the impending wet season. One session participant was only partially joking when he declared that if flooding on that magnitude occurred again his supervisors would ensure that he wouldn't be around to attend the next flooding forum. On the other hand, most participants wanted to recommend effective, sensible, cost-effective solutions, but the lack of basic data and information made developing even short-term stop-gap measures difficult. Opinions also varied among participants on the difference between "short-" and "long-term." Because of the lengthy federal budget cycle, some of the federal participants suggested anything less than five years was decidedly short-term. And yet waiting five years before taking any action did not seem acceptable either. The recommended measures listed below fall along a continuum of effort, time, and cost as far as planning, design, and

implementation. Presumably, the best solutions will have a strategic mix of measures addressing both long-term and short-term needs.

Once a flooding risk tolerance policy is established, a broad cost-benefit analysis of the recommendations could be undertaken. The forum's recommendations run the gamut on timeframes, acceptability, and implementation complexity. They also differ significantly in costs and benefits. It was a tremendous challenge to attempt within two days to enumerate all of the flooding and stormwater issues and gain consensus on which solutions should be recommended. Consequently, it was impossible to weigh the recommendations against even a high-level cost-benefit rubric. However, the need for such an analysis remains.

Despite the fact that the Stormwater Management session was originally intended to focus solely on whether stormwater management techniques, either on-site or off-site, would alleviate flooding risks, this session also tackled the larger systemic issues, and, as a result, some recommendations overlapped with the Infrastructure Session. Likewise, while we intended the Infrastructure Session to focus its deliberations on the larger system issues, those participants addressed more site-specific recommendations. In the end, the recommendations from both sessions successfully addressed the full scope of issues.

Recommendations

The recommendations developed by the "Stormwater Management" Working Group as part of the Flood Forum follow:

1. Undertake an In-depth Study of the Hydrology and Sewer System: A comprehensive understanding of the interior flooding risk in the monumental core is lacking. Participants recommended that an in-depth study be scoped, funded, and completed to provide a baseline for the flooding risk, to determine how to reduce or eliminate the risks, and to estimate how much each solution would cost. This item is discussed in much more detail under Recommendation #1 in the Infrastructure Challenges Section.
2. Improve Stormwater Governance: Stormwater governance in the District should be transparent, straightforward, and effective. The participants did not outline how stormwater governance should be improved because that task was beyond what could be accomplished in a two-day meeting. It remains an issue nonetheless. If the larger question of stormwater governance is not addressed, District problems of stormwater quantity and quality will remain. A useful next step is to engage and empower a small group of local and federal decision makers to review efforts undertaken in the past, identify the roles and responsibilities for effective stormwater management, and consider acceptable collaborative solutions for the

future. The working group should consist of high-level officials and have a schedule to complete its work. The resulting recommendations should address specific goals and how such an effort should be structured to create a sustained and aggressive federal and local commitment toward solving the problem.

3. Dedicated Funds for Sewer Operation, Maintenance and Capital Improvements for the Monumental Core: Given the sewer system's age, and the critical geographic area it serves, dedicated funding for routine inspection, maintenance, and repairs can help ensure that the system operates at maximum capacity. Funding issues for the sewer system are discussed in more detail below; however, participants agreed that sufficient funding should be dedicated to monumental core sewers.
4. Local Stormwater Management Improvements:
   Site-specific stormwater management practices can help reduce the peak flow of stormwater into the sewer system. Below are some specific recommendations to promote more innovative stormwater management controls in the District:
   a. Develop Stormwater Best Management Practices Manual: NCPC should develop and promote best management practices (BMPs) for stormwater. GSA should promote innovative stormwater management techniques as part of their green building construction guidelines and develop a stormwater standard or guideline for federal buildings.
   b. Incentives for Low Impact Development: Incentives can help make LID measures more widespread.
   c. Regulatory Approach to Stormwater Management Regulations: If incentives are not sufficient to produce the desired change in construction practices, a regulatory approach can ensure that building owners manage their stormwater in a more sustainable way. The District has the authority to adopt stormwater regulations for private development to promote LID and other innovative techniques.
5. Set Risk Tolerance Policy / Broad-spectrum Cost-Benefit Analysis:
   Disaster planning typically includes decisions regarding the acceptable level of risk. Once the risk tolerance is established, planners and policy makers can determine how to accommodate that risk level. Moving forward, federal policy makers should determine the flooding risks acceptable for the monumental core. Setting a risk tolerance will necessitate a deeper understanding of what is at risk.

Infrastructure Challenges and Opportunities

Infrastructure Presentations

Roger Gans, District of Columbia Water and Sewer Authority
Mr. Gans and DC WASA's consultant presented an overview of the District's sewer system and a capacity assessment of the sewer. He also reviewed the June 2006 flooding and facility operations during the event.

Jodi Beauchamp, US Army Corps of Engineers
Ms. Beauchamp discussed the Corps capabilities with regard to engineering studies and how their staff might help with research and data collection.

Emeka Moneme, District Department of Transportation
Mr. Moneme discussed DDOT's stormwater-related activities. He outlined the District's commitments as well as DDOT's specific responsibilities in meeting those commitments.

This session was to tackle broad system-wide issues and solutions to prevent flooding; however, participants discussed a range of issues and remedies from individual building flood-proofing measures to system-wide improvements such as more frequent street cleanings. This session also discussed the problems with the existing stormwater governance in the District which—because the responsibilities are shared among several agencies— is not as coordinated or responsive as possible. To tackle the problems of governance and incomplete information, this session, like the Stormwater Management session, recommended that federal and local stakeholders undertake a comprehensive, intergovernmental study to develop a "big picture" solution. Issues of stormwater governance and the need for more complete information is discussed in more detail in the previous section. This section focuses on the other issues covered by the Infrastructure session.

Potential mitigation strategies fall into two contextual categories: ***Site-Specific*** and ***System-Wide***. A site-specific strategy could require federal buildings located in the monumental core to be modified into flood-proof fortresses, shielded from excess stormwater through moats, dams, and fail-proof seams. These measures would prevent building flooding from water seepage in the event of a street flood, and stormwater would be confined to the streets until it could drain away. This strategy would require a site-by-site investigation and retrofitting each building within the monumental core. The costs would be individually borne by the various federal agencies and presumably funded through their capital improvement program or their operations budget. The strategy could be undertaken by the federal government alone, without the collaboration and cooperation of the District, and coordination among federal government and

non-federal government agencies, such as WMATA, would not be necessary to proceed. As a result, one potential negative impact is that there would not be a complete understanding of what would happen to excess stormwater when the sewer system's capacity is exceeded. If stormwater can not drain into the buildings in the Federal Triangle Area, the water will drain off somewhere else (unprotected private buildings perhaps) or will end up as standing water on the street until it can finally drain into the sewer. From the perspective of the federal building owners, planning for the streets to serve as a holding area for excess stormwater is a superior alternative to flooded subbasements and inoperable, ruined building system equipment. However, as little as six inches of excess rain will cause the Metrorail system to be rendered inoperable, causing this potential solution to be less favored by WMATA and the scores of commuters who rely on Metrorail. Thus, if building-specific solutions are implemented it would be important to coordinate various building or structure flood-proofing measures to protect against unintended adverse and/or cumulative stormwater impacts to adjacent properties.

An alternative strategy could consist of devising an area-wide, systematic solution to ensure that the sewer system would completely accommodate stormwater run-off in all but the most severe and unusual storms. Though this more comprehensive approach would likely be more effective in preventing monumental core flooding, the effort would be significantly more complex, long-term, and costly. With little background information available, the working group can only speculate at the potential capital improvements and repairs that would be necessary to significantly minimize the flood risk. The more comprehensive solution would be significantly more difficult to fund and implement because there is currently no mechanism or formula for cost-sharing between the federal and local governments. Moreover, it is unclear which authority or organization should oversee the study and implementation of the necessary capital improvements. The federal and District governments would need to agree upon how to share the costs of implementing such a systematic solution.

It is important to note that regardless of the strategy selected, site-specific or system-wide, or even if both strategies are employed, there is always the chance that a storm could overwhelm any preventative measures. Given that inevitability, it is essential that there is a well-conceived plan for handling flooding that includes back-up power generation, ample pump capacity, and other emergency response needs.

Recommendations

The recommendations developed by the Infrastructure Challenges and Opportunities Working Group as part of the Flood Forum follow:

1. Stormwater Management Study for the Monumental Core: A thorough hydrology and sewer engineering study is needed for the monumental core. Once this information is collected, modeling can be performed using various storm scenarios to determine sewer performance; potential measures to increase system capacity, if necessary and desired. Ideally, the study would also estimate the cost to design and construct those measures.

   ACOE has the technical expertise to manage such a study on a cost-reimbursable basis; however, the participants did not recommend an entity to perform and manage the study. Selecting an engineering consultant should be determined by funding availability, the schedule for performing the analysis, familiarity with the sewer system, and other factors.

   Funding for the study also needs to be determined. Presumably, this type of study would be the first phase of a more long-term, systematic plan compared to a building-by-building approach. While it is important to pursue a long-term study, it is necessary to develop that could be more rapidly implemented as well. The forum yielded two specific solutions that an engineering study could evaluate for feasibility. One measure would be to construct an interim pumping station to help increase the capacity of the Constitution Avenue sewer. Another is to utilize an existing condensate pipe that historically served the Federal Triangle but is currently no longer in use. An in-depth study could consider the viability of both of these potential near-term solutions in conjunction with a host of longer-term solutions.

2. Building Flood-proofing: There are a number of potential site-specific flood prevention measures to keep stormwater out of buildings and protect critical building systems. The measures vary significantly in cost, ease of implementation, and appropriateness. They include, but are not limited to:
   - Outfitting Buildings with water detection alarms,
   - Relocation of all critical buildings systems from basement/1st floor levels to higher levels,
   - Constructing knee walls around the buildings,
   - Sealing all utility entrances and waterproofing other potential points-of-entry for water seepage,
   - Digging moats around the buildings as retention ponds, and
   - Equipping all buildings with pumps and back-up power generators.

Participants suggested that NCPC could prepare a reference handbook for federal agencies containing approved "best practice" flood-proofing measures. NCPC's *Designing and Testing of Perimeter Security Elements* and *The National Capital Urban Design and Security Plan* were cited as prototypes for this effort. The handbook should contain temporary measures that are permissible and more permanent measures consistent with NCPC, CFA, and other authorizing agency guidelines.

3. Street Cleaning and Catch-Basin Cleaning Coordination: Street debris can cause flooding by preventing rain from entering the sewer system, or when trash obstructs pipes and reduces system capacity. While the solution is straight-forward, debris-blocked drains are a consistent problem in the city. More than one agency is responsible for keeping trash and debris out of the sewer system, and numerous street fairs, demonstrations, public gatherings, and tourist events generate a great deal of litter and debris in the monumental core. DC WASA and DC DPW should more closely coordinate their activities to improve this situation year round, but particularly in anticipation of large storms or after large public events.

Improvements to the National Mall Levee: The forum focused on interior flooding. However, both local and federal participants noted the need for levee improvements along the National Mall (specifically 17th Street, NW), to be funded and completed to protect the monumental core from riverbank flooding.

Next Steps

The contents of this report have been reviewed for accuracy and completeness by the four cosponsoring entities: NCPC, GSA, DHS, and the District Government. A number of participants also were asked to review a draft version to ensure we captured the breadth and depth of the proceedings.

NCPC, as the chief planning agency for the federal government and as catalyst for the inter-governmental, multi-agency flood forum, will facilitate the continuing federal and local dialogue on stormwater and flooding risks in the monumental core to further hone and promote the recommendations contained in the report. NCPC also may convene smaller inter-agency groups to discuss the recommendations.

NCPS staff recommended that a Floodwater Steering Committee be established and include representatives from NCPC, GSA, DHS, OMB, and the District of Columbia government including specifically the City Administrator's Office, DDOE, DDOT, DC WASA, and DC HSEMA.

NCPC recommends that the Steering Committee meet approximately three to four times over the next 18 months. The first meeting should be in early fall 2007; the goal of the meeting would be to present a workplan for moving forward. The Steering Committee would issue a final report on its accomplishments no later than one year after the first meeting. Three working groups focused on the following should be established:

1. Information Collection for System-wide and Site Specific Improvements – This group, which should include a DC WASA representative, would focus on the data and modeling necessary for decisions on which sewer system, area-wide, and site-specific improvements are needed. They would draft the scope of work for an engineering study and estimate the study's cost. Recommendations for capital improvements are possible at the study's conclusion. Once that task is complete, the group would turn their attention to developing best management practices and how to promote low impact development, either with incentives, policy, and/or regulations. They would also develop an acceptable level of flooding risk for the monumental core.
2. Physical Solutions – This group would develop site specific recommendations for flood-proofing buildings in the area of impact and develop a BMP manual.
3. Governance – This group would review how stormwater is managed in the District and recommend ways to improve the current system of authority and regulatory control. They also would review operations and maintenance issues with regard to agency responsibilities and schedules.

4. **Emergency Preparedness** –This group would address the forum's recommendations on emergency response.

While certain agencies and organizations are critical to the success of these proposed working groups, NCPC would encourage all interested federal and local officials to participate throughout the process to continue the exemplary interagency cooperation and collaboration that began with the June 12 and 13, 2007 Floodwater Forum.

Comments, Corrections, and Other Important Observations

NCPC staff presented the forum's findings and recommendations at the August 2, 2007, National Capital Planning Commission meeting held at 401 9th Street NW, Suite 500 -- North Lobby, Washington, DC, 20004.

Interested parties may submit comments to NCPC at flooding_forum@ncpc.gov.

Appendix D: Useful Acronyms and Other Important Abbreviations

ACOE	U.S. Army Corps Engineers
AWC	Anacostia Waterfront Corporation
COOP	Continuity of Operations Program
CSO	combined sewer overflow
CWA	Clean Water Act
DC DOE	D.C. Department of the Environment
DC DOH	D.C. Department of Health
DC DPW	D.C. Department of Public Works
DC EMA	D.C. Emergency Management Agency
DCRA	Department of Consumer and Regulatory Affairs
DC WASA	D.C. Water and Sewer Authority
DDOT	D.C. Department of Transportation
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
EO	Executive Order
FCIP	Federal Capital Improvement Plan, prepared by NCPC
FEMA	Federal Emergency Management Agency
GSA	General Service Administration
LEED	Leadership in Energy and Environmental Design - the green building system of the U.S. Green Building Council
LTCP	Long Term Control Plan
MOU	Memorandum of Understanding
MS4 Permit	Municipal Separate Stormwater System Permit
NEPA	National Environmental Protection Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWS	National Weather Service
OMB	Office of Management and Budget
USGS	U.S. Geological Survey
WAWAS	Washington Area Warning Alert System